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THE RESISTIVITY OF AQUEOUS
SOLUTIONS OF SODIUM CHLORIDE

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THE RESISTIVITY OF AQUEOUS SOLUTIONS OF SODIUM CHLORIDE

by:

Martin B. Kraichman

ABSTRACT: Resistivity measurements were made of various aqueous solutions of sodium chloride using a calibrated conductivity cell with silver-silver chloride electrodes. Results in the form of curves are presented for salt concentrations from 1 to 26% in the temperature range from 5°C to 30°C.

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Physics Research Department
U.S. NAVAL ORDNANCE LABORATORY
WHITE OAK, MARYLAND

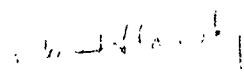
NOLTR 64-42

3 March 1964

The work reported herein was done in 1954 in the Electricity and Magnetism Division, Physics Research Department and is intended for information only.

The author wishes to acknowledge the collaboration of S. P. Haddad, who was a member of the Electricity and Magnetism Division at that time.

R. E. ODENING
Captain, USN
Commander


Z. I. SLAWSKY
By direction

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THE RESISTIVITY OF AQUEOUS SOLUTIONS OF SODIUM CHLORIDE

Purpose

Whereas the resistivity of weak aqueous solutions of sodium chloride are readily available in many physical and chemical tables, the values of the resistivity of concentrated solutions as a function of temperature and percentage salt are not easily found. It is the purpose of this report to supply such information for various sodium chloride concentrations ranging from 1% to the saturation value of 26% in the temperature range from 5°C to 30°C. While only engineering accuracy is claimed for these results, they should be sufficiently good for many purposes such as the modeling of dissipative media for electromagnetic studies.

Measurement Procedure

The resistivity measurements were made using chemically pure, aqueous solutions of sodium chloride and a calibrated conductivity cell with silver-silver chloride electrodes. Figure 1 shows the construction of the cell. The outside diameter of the cell is about 3 inches and the length is about 22 inches. The silver-silver chloride disc electrodes are 2-1/2 inches in diameter and are separated by approximately 10 inches.

Before each measurement, the cell was carefully flushed by repeated immersion in the solution to be measured so as to remove any previous solution from between the electrodes. The resistance of the cell was then measured with a Wheatstone bridge. The measurement was repeated with the polarity of the cell reversed, and an average of the two readings was taken.

Results

The resistivity ρ in ohm-cm. was calculated from the formula

$$\rho = 0.69 (R_m - 0.32),$$

in which R_m is the measured value of the cell resistance in ohms, the factor 0.69 represents the cell constant in centimeters and the quantity 0.32 is the resistance of the lead wires in ohms.

The results are presented in Figures 2, 3, and 4 in which the experimental points are indicated by small circles.

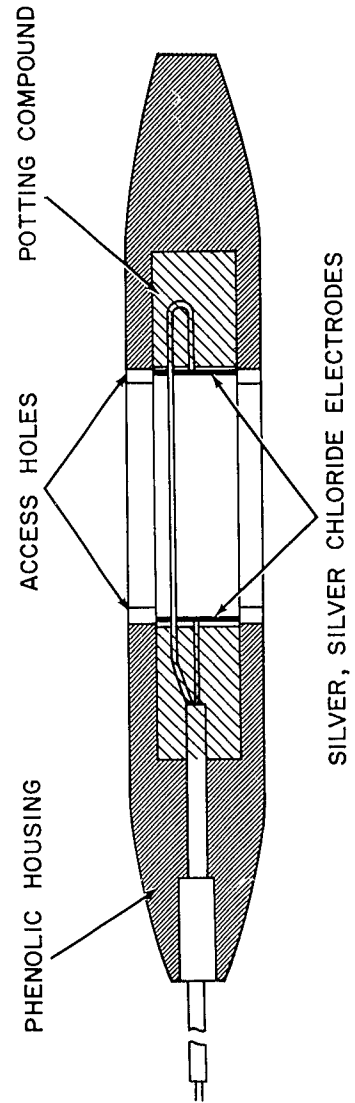


FIG.1 CONDUCTIVITY CELL

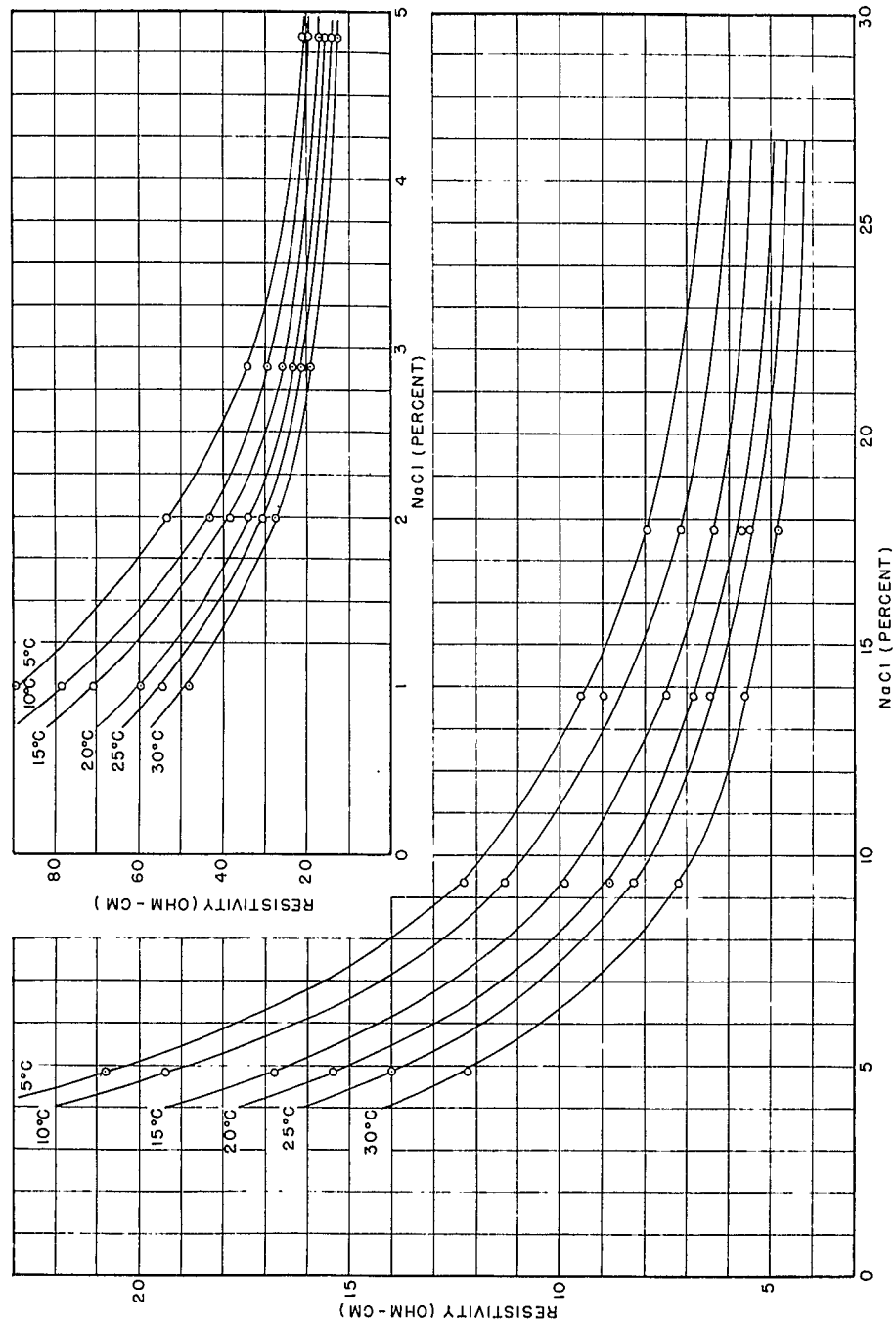


FIG.2 RESISTIVITY VS PERCENT NaCl

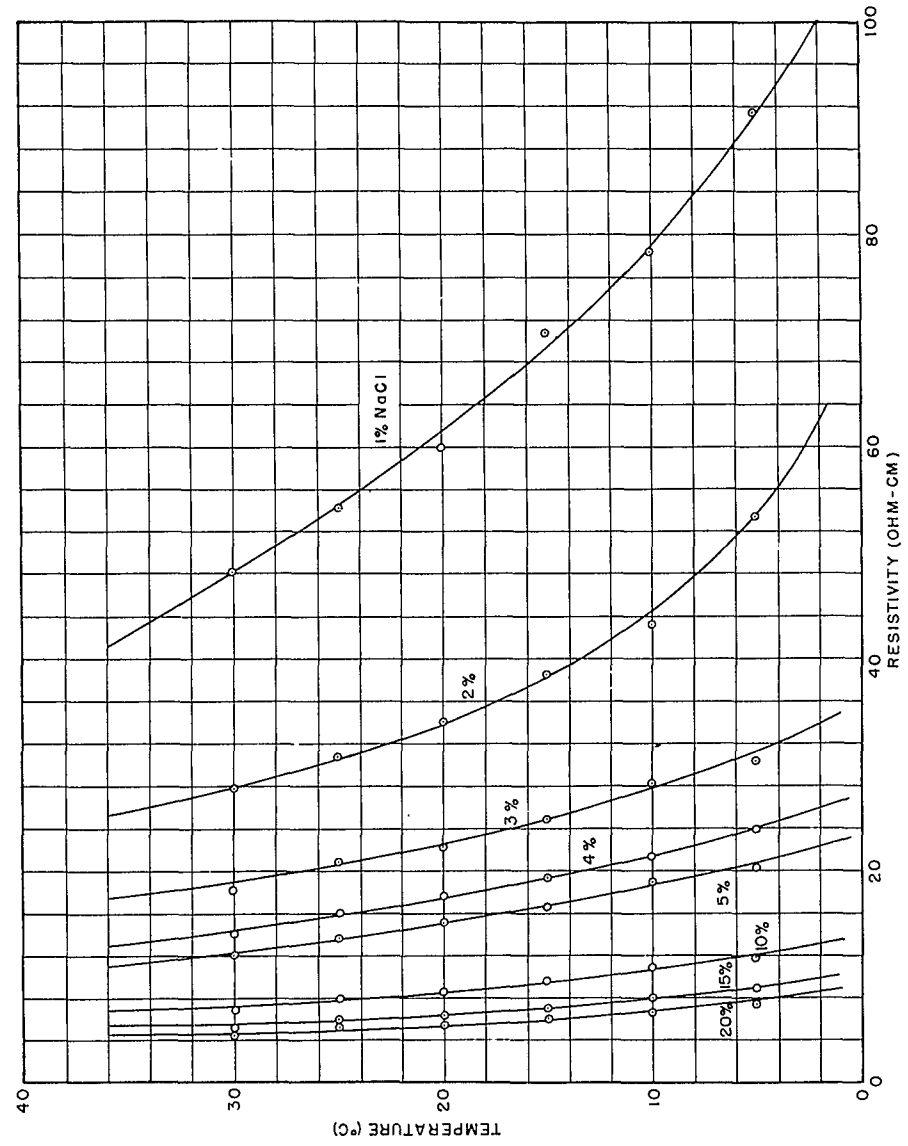


FIG. 3 TEMPERATURE VS RESISTIVITY

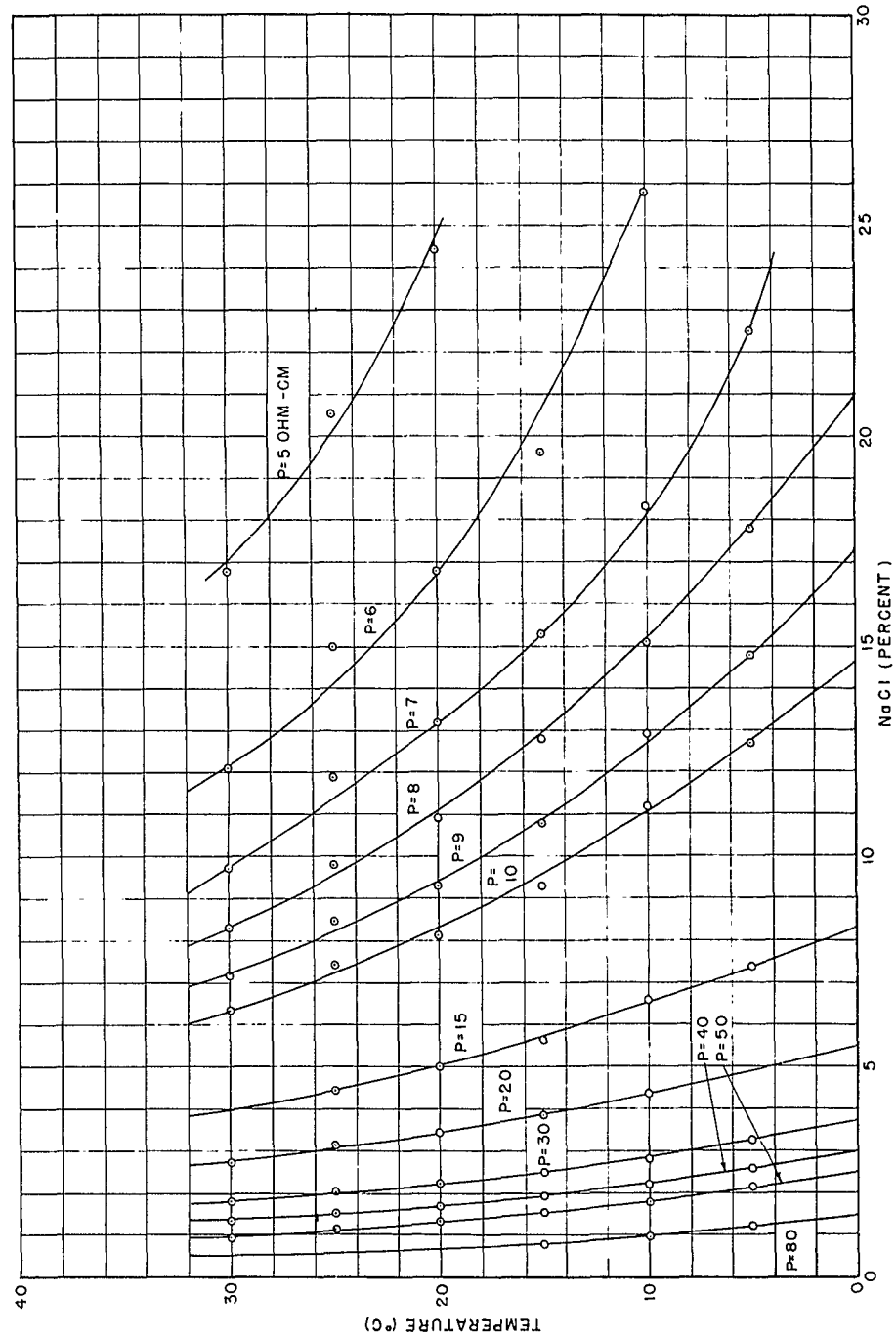


FIG. 4 TEMPERATURE VS PERCENT NaCl

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SUBJECT ANALYSIS OF REPORT					
DESCRIPTORS		CODES	DESCRIPTORS		CODES
Resistivity		REST	Curves		CURV
Sodium		SODI	Salt		SALT
Chloride		CHLO	Concentrations		CNCT
Aqueous		WATR	Temperature		TEMP
Solution		SOLT	Percentages		PRCN
Measurement		MEAU	Variation		VART
Cal ibrated		CALB			
Conductivity		COND			
Cell		CELL			
Silver		SILV			
Zinc		ZINC			
Electrodes		ELED			

<p>Naval Ordnance Laboratory, White Oak, Md. (NOL technical report 64-42) THE RESISTIVITY OF AQUEOUS SOLUTIONS OF SODIUM CHLORIDE, by Martin B. Kraichman. 3 March 1964. 6p. illus., charts.</p> <p>UNCLASSIFIED</p> <p>Resistivity measurements were made of various aqueous solutions of sodium chloride using a calibrated conductivity cell with silver-silver chloride electrodes. Results in the form of curves are presented for salt concentrations from 1 to 26% in the temperature range from 50C to 300C.</p>	<p>1. Resistance, Electric Sodium chloride - Conductivity Title II. Kraichman, Martin B.</p>	<p>Naval Ordnance Laboratory, White Oak, Md. (NOL technical report 64-42) THE RESISTIVITY OF AQUEOUS SOLUTIONS OF SODIUM CHLORIDE, by Martin B. Kraichman. 3 March 1964. 6p. illus., charts.</p> <p>UNCLASSIFIED</p> <p>Resistivity measurements were made of various aqueous solutions of sodium chloride using a calibrated conductivity cell with silver-silver chloride electrodes. Results in the form of curves are presented for salt concentrations from 1 to 26% in the temperature range from 50C to 300C.</p>	<p>1. Resistance, Electric Sodium chloride - Conductivity Title II. Kraichman, Martin B.</p>
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